



TxDOT ABC/PBES EXPERIENCES

Michael Hyzak, P.E.



TxDOT ABC/PBES Experiences

1	Foundations	3-12
2	Bents	13-26
3	Abutments	27-30
4	Columns	31-33
5	Approach Slabs	34-35
6	Bridge Decks	36-51
7	Beam Systems	52-58
8	Slides/Launching/Creative Phasing	59-70

- **Drilled shafts and precast/prestressed and steel piling**

- **ABC features in Texas**
 - **Steel piling: connections and durability provisions**
 - **Large diameter mon shafts**
 - **Cylinder piles**
 - **Large square piling: developing 36” section**

Foundations: Steel and Precast/Prestressed Piling



Steel Piling: Guidelines for Use

Forms & Publications

- Transportation Links
- Complaints
- Federal Transportation Agencies
- Maps
- State Departments of Transportation
- Consultants and Contractors
- Doing Business
- Newsletters
- Safety Information
- Online Forms FAQs
- Tools and Plug-Ins

Page Options

Bridge Publications

Home > Inside TxDOT > Forms & Publications > Consultants and Contractors

You may download the software ([Tools and Plug-Ins](#)) needed to access forms or view frequently asked questions regarding forms ([Online Forms FAQs](#)).

Publications

- [Bridge Facts](#)
- [Bridge Unit Costs](#)
- [Construction and Maintenance](#)
- [Design](#)
- [Geotechnical Resources](#)
- [Highway Bridge Program](#)
- [Inspection](#)
- [Report on Texas Bridges](#)
- [Substructure/Superstructure Design Examples and Spreads](#)
- [Underclearance](#)
- [Miscellaneous](#)

Bridge Facts

Title

Geotechnical Resources

Title	Format
Approved Concrete Block Retaining Wall Systems	HTML
Approved MSE Panel Systems	HTML
Drilled Shaft Design Examples	PDF
Guidelines for the Use of Steel Piling for Bridge Foundations	PDF
Loss of Backfill in Mechanically Stabilized Earth	PDF
Mechanically Stabilized Earth (MSE) Wall Design Example	PDF
Piling Design Examples	PDF
Proprietary Retaining Wall System Review	PDF
Spread-Footing Wall Design Example	PDF

<http://ftp.dot.state.tx.us/pub/txdot-info/brg/geotechnical/steel-pilings.pdf>

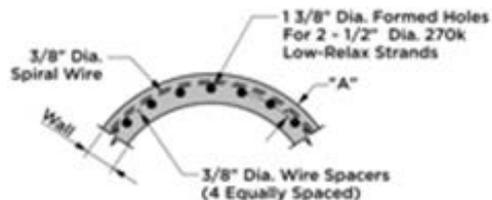
Foundations: Precast Cylinder Piles

Copano bay bridge (first in TX)

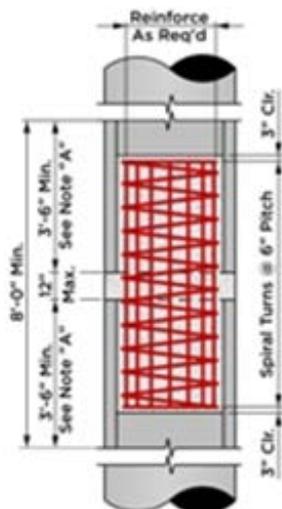
54" and 66" dia.



Foundations: Precast Cylinder Piles

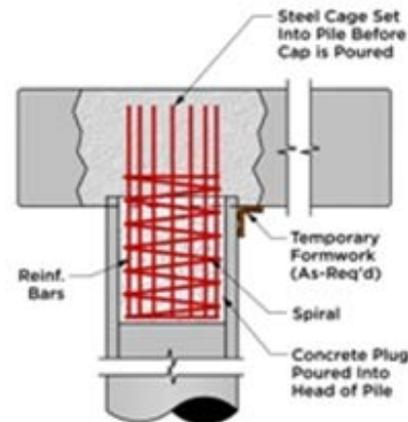


Typical Reinforcing Detail

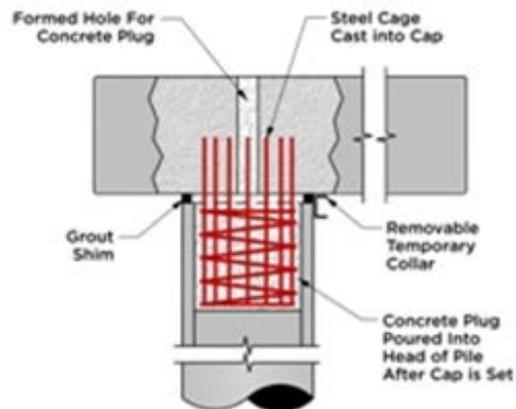


Pile Splice Detail

Note "A":
End surfaces in Good Condition May be Brought into Contact at Pile Splice. Rough or Damaged Ends Shall Be Shimmed Apart And Spliced in Accordance With This Detail.



Cast In Place Pile Cap Detail



Precast Pile Cap Detail

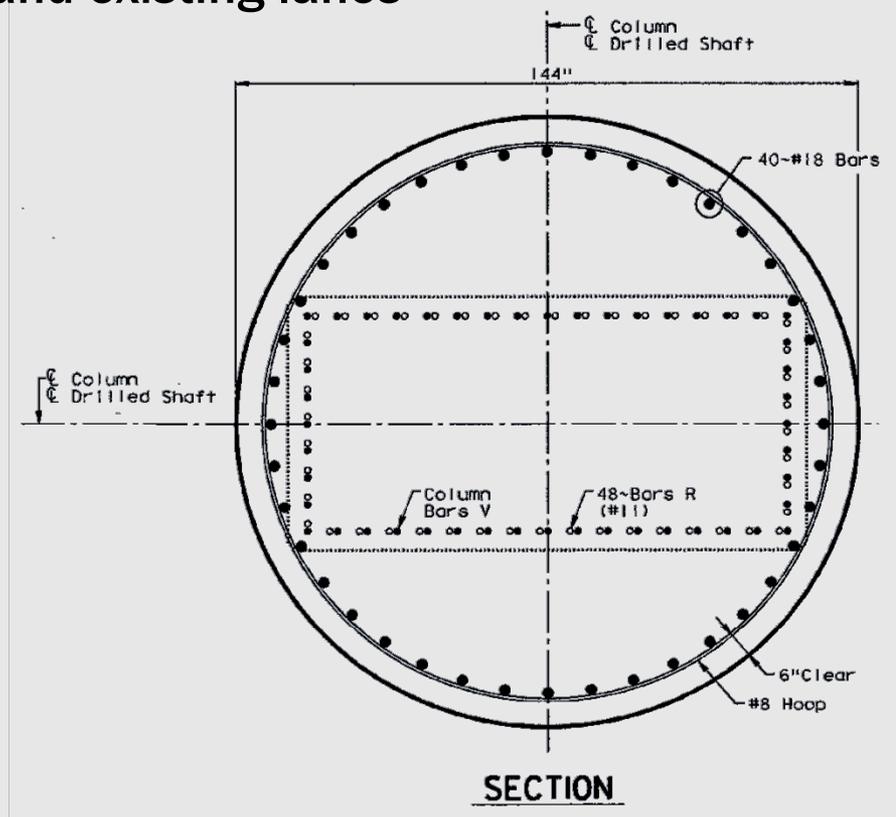
Foundations: Large Mon shafts



- 12 ft. dia. x 130 ft.
- IH 45 Clear Lake, TX

Foundations: Large Mon shafts

- Directly frames to column w/o footing
- Much quicker: 2 days versus 2 weeks
- Smaller footprint: avoid utilities and existing lanes



Foundations: Large Mon shafts

- 40 ~ #18's



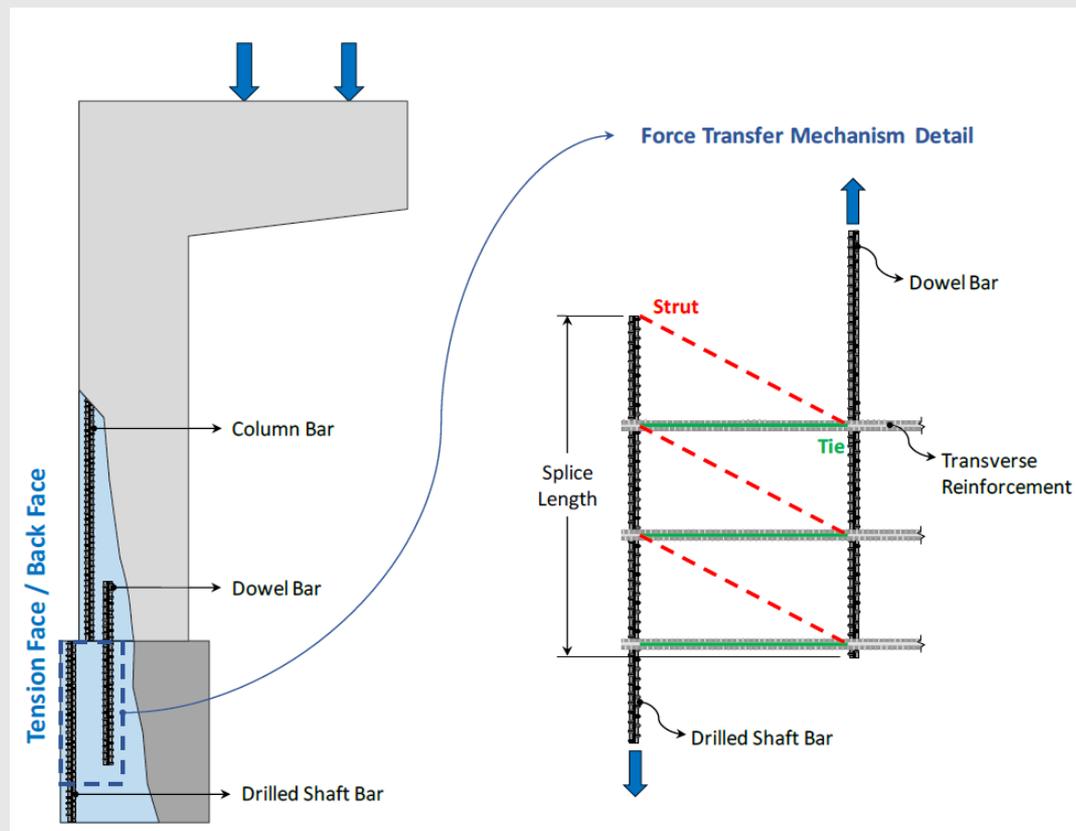
Foundations: Large Mon shafts

- Larger equipment and material volumes
- Need quality construction
- Concrete mix design important
- Increased structural demand on substructure



Foundations: Large Mon shafts

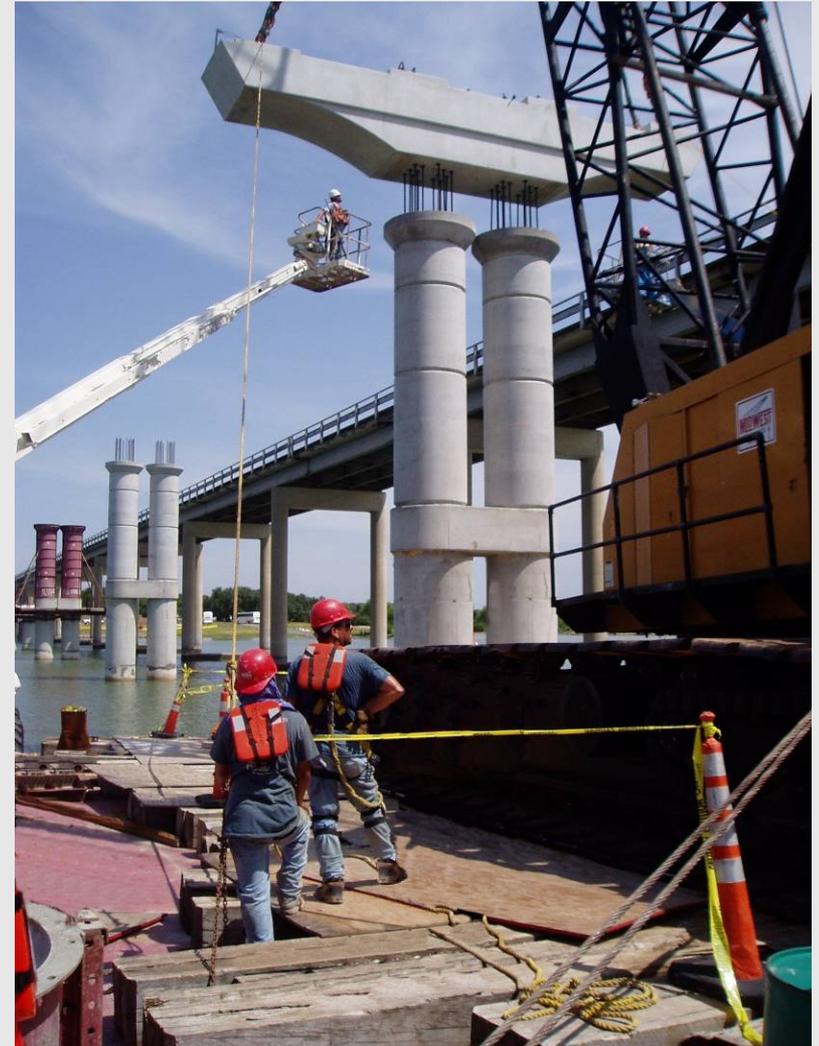
- TxDOT Research Project 16-33: “Non-Contact Splices at Drilled Shaft to Bridge Column Interfaces”



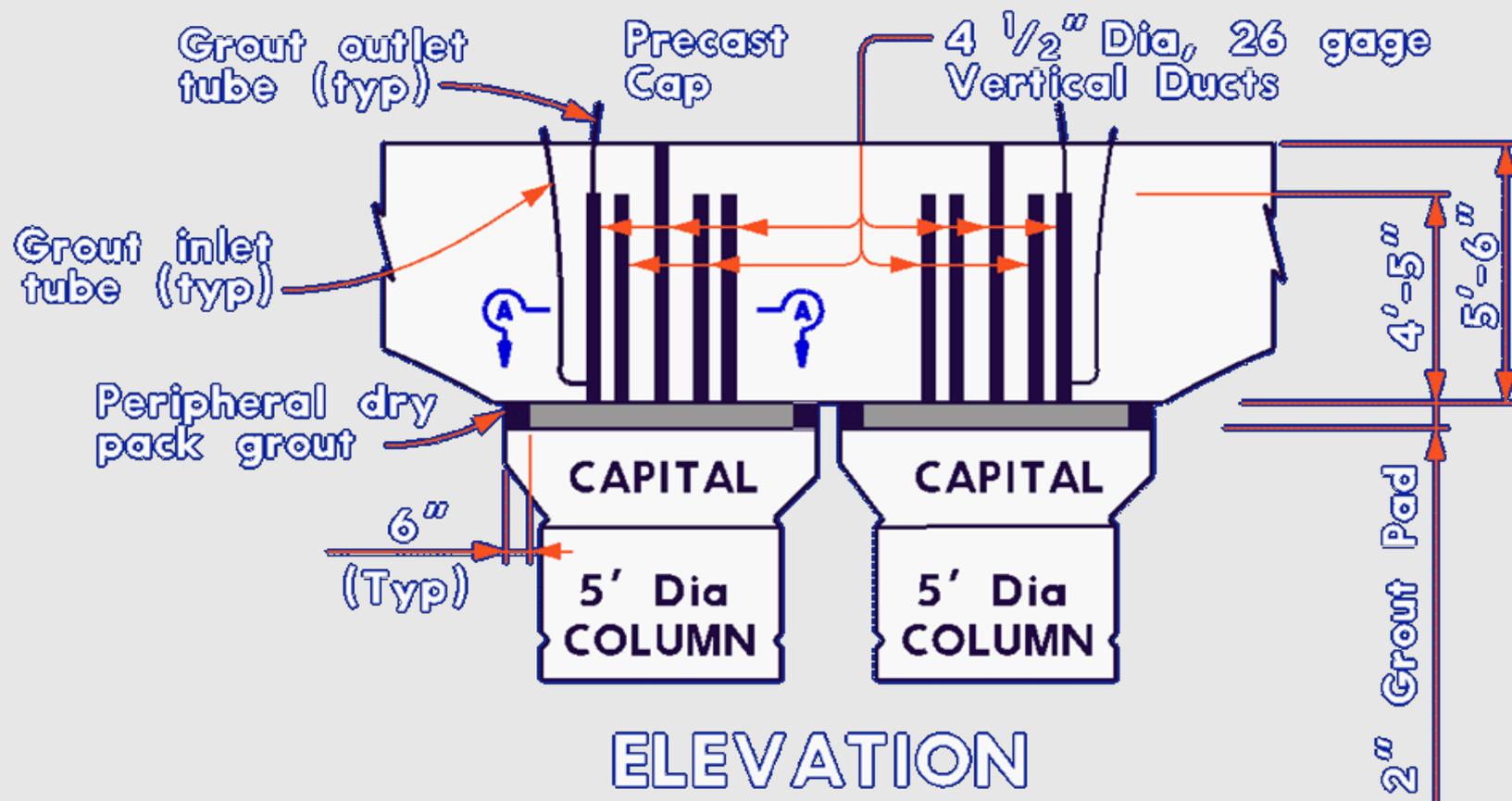
- **Precast bent caps**
 - First designs in the 1990's
 - Research on connections
 - Pile connections (welded, bars, pockets)
 - Standardized details
 - Pretensioned caps
 - Column pockets
 - Large caps

Precast Bent Caps

- Eliminates many tasks associated w/ CIP construction
- TxDOT Research
 - Project 1748
 - Project 4176
- Grouted vertical duct connections



Precast Cap Connection Design



Precast Cap Connection Design



Multi-Column Precast Bent Cap



Trestle Bents: Concrete Piles



Trestle Pile Bents: Concrete Piles



Trestle Pile Bents: Steel Piles



Precast Concrete Straddle Bent



Precast Hammerhead Caps: Connection Pocket with Columns

- Value engineered by contractor
- Adapts NCHRP 12-74 Report 681 details



Precast Cap: Connection Pocket with Piles

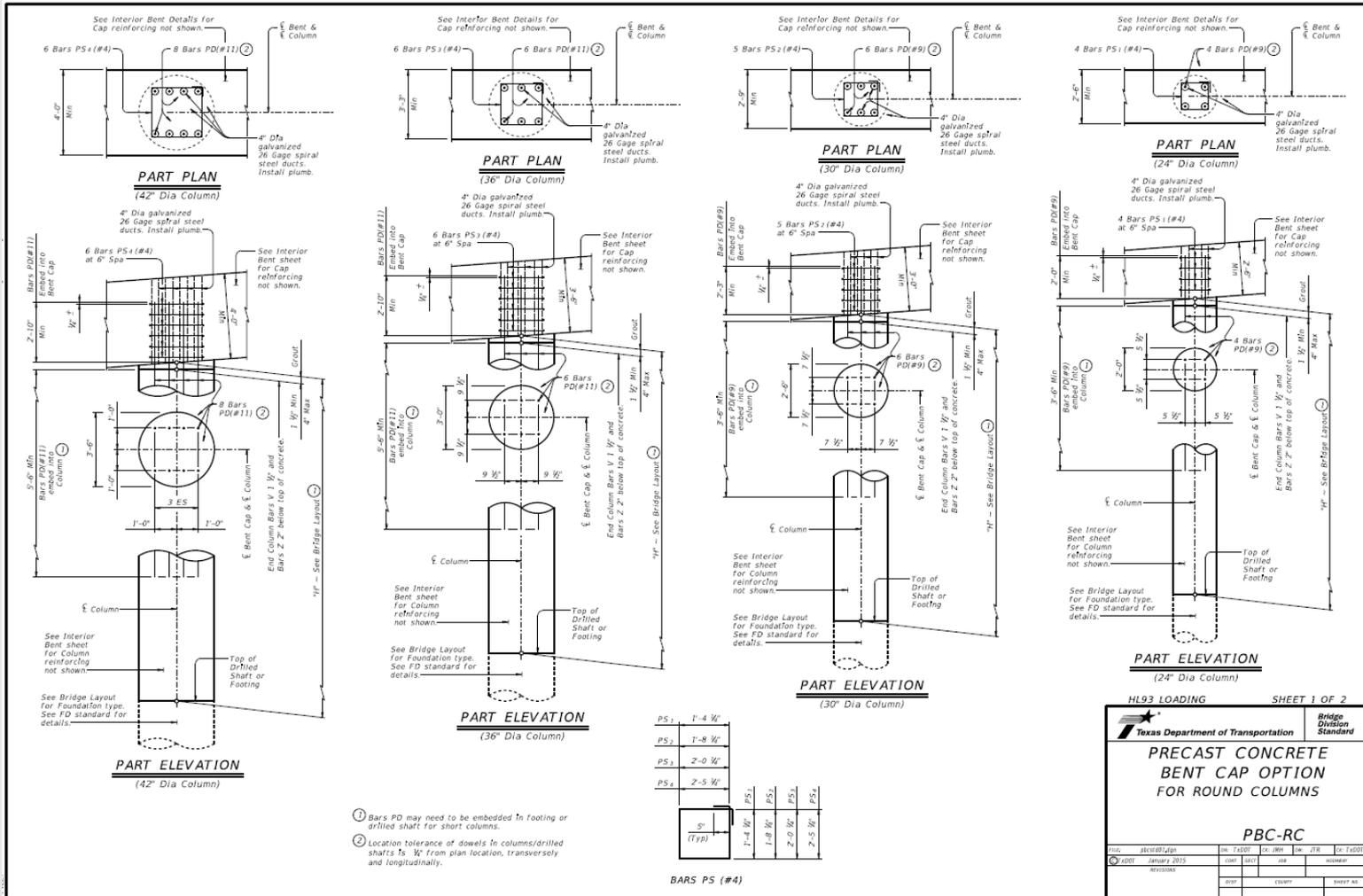


- Corrugated pocket in bottom



- Filling connection pocket with grout

Precast Cap Option: Column Connection Standard



<http://ftp.dot.state.tx.us/pub/txdot-info/cmd/cserve/standard/bridge/pbcstd01.pdf>

Second Generation Pretensioned Precast Cap

- 4 Construction Projects
- Research Project 6863



Abutments

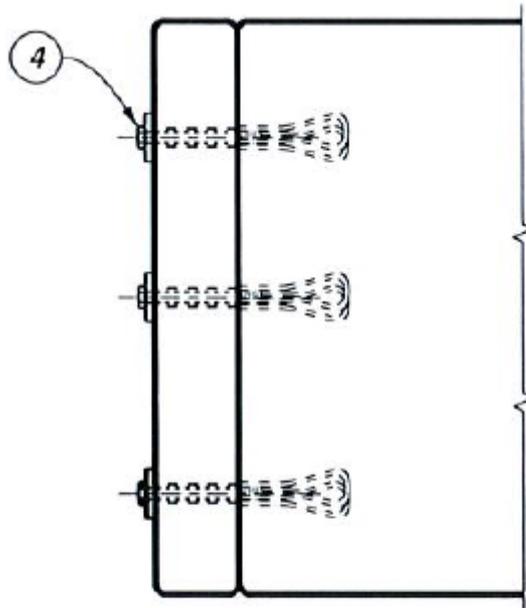
- Use spill through abutments

- ABC features in Texas
 - Precast cap concepts adopted with precast backwall
 - Precast wings or tapered
 - Integral abutments not yet, but looking

Precast Abutments



Precast Abutment Wingwall



- ④ Provide 1 $\frac{1}{4}$ " Dia. x 13" Coil Bolts, Dayton/Richmond B-14 or equivalent, with plate washer (4" Outside Dia., $\frac{3}{4}$ " Thickness, 1 $\frac{3}{8}$ " Dia. center hole).

WINGWALL TO END CAP DETAIL

Tapered Precast Abutment



- **Precast columns**
 - **Segmental**
 - **Hollow shells**

Columns: Segmental Substructures



Hollow Precast Columns



Approach Slabs

- Only one project
- Synergy with precast pavement

Precast Pavement/Approach Slabs

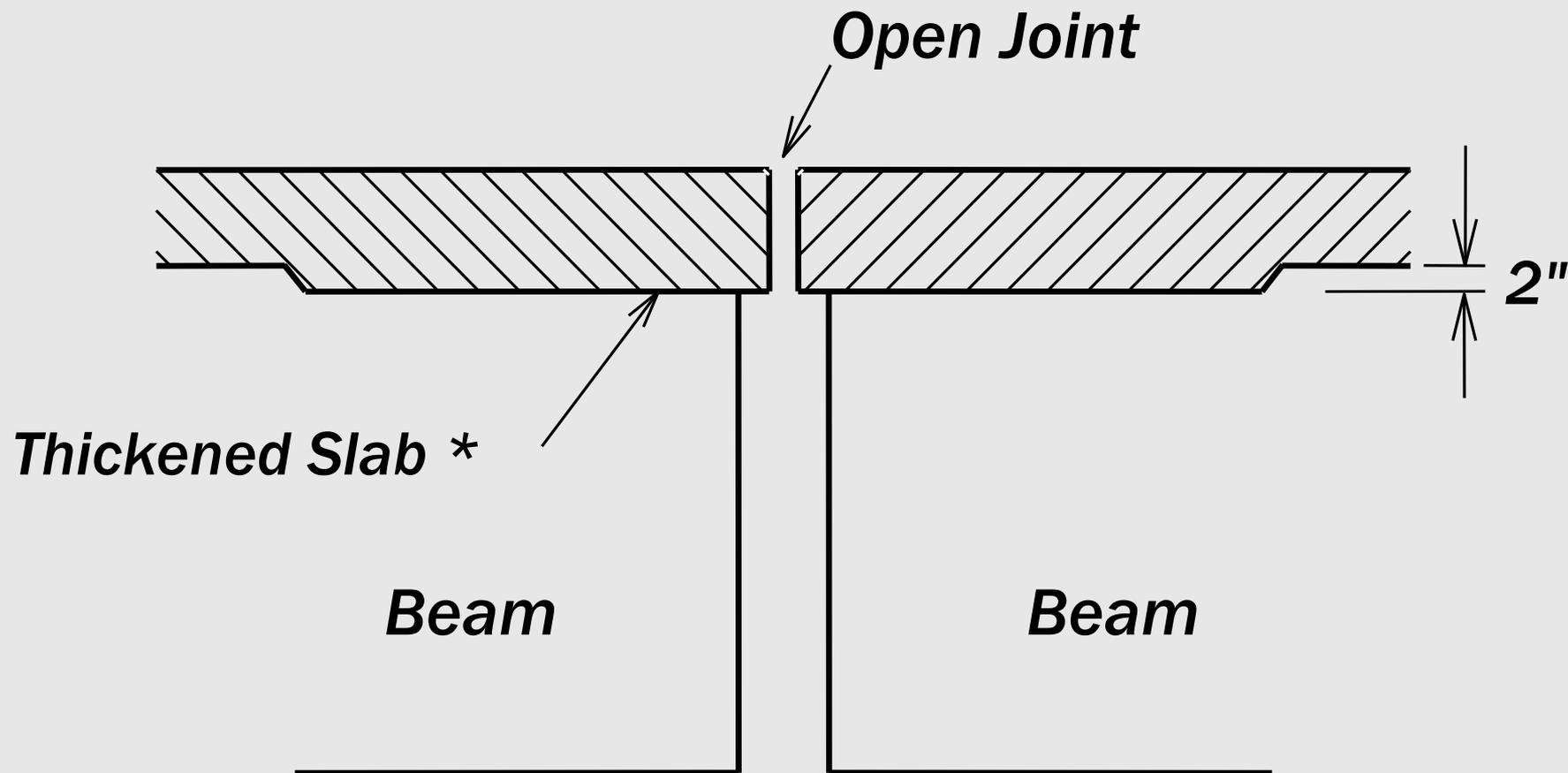


- **ABC features in Texas**
 - **Partial depth precast concrete panels (PCP)**
 - **PCP's to end and skewed panels**
 - **Limited diaphragms**
 - **Empirical decks and WWR**
 - **Precast overhangs**
 - **Full depth panels**

Bridge Decks: PCP



Bridge Decks: Thickened End Diaphragm



<http://ftp.dot.state.tx.us/pub/txdot-info/cmd/cserve/standard/bridge/igtssts1.pdf>

PCP's to End of Span

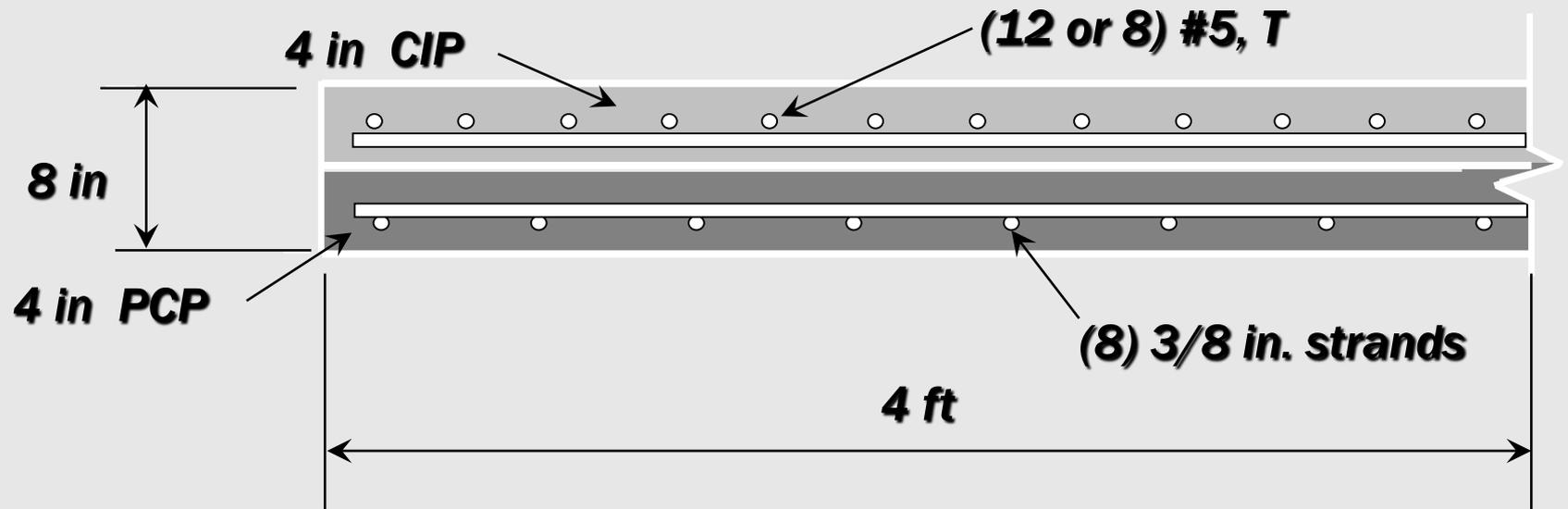


▪ Old way



▪ New way

PCP's to End of Span



- **Advantages**
 - Safety (immediate work platform)
 - Quicker: eliminates 1 or 2 steps in construction process (setting plywood or PMDF and removing plywood)
 - Panels seal better than PMDF
 - No PMDF-beam welds to break loose
 - Cost
- **Research projects 4418 and 5367**
 - Ultimate capacity
 - Fatigue behavior
 - Skewed details

Precast Overhangs



Precast Overhangs



Precast Overhangs: Second Generation



Precast Overhangs: Second Generation



Precast Overhangs: Second Generation



Full Depth Precast Deck Panels

- NCHRP 12-65 / report 584 concept
- Live Oak creek bridge in West Texas



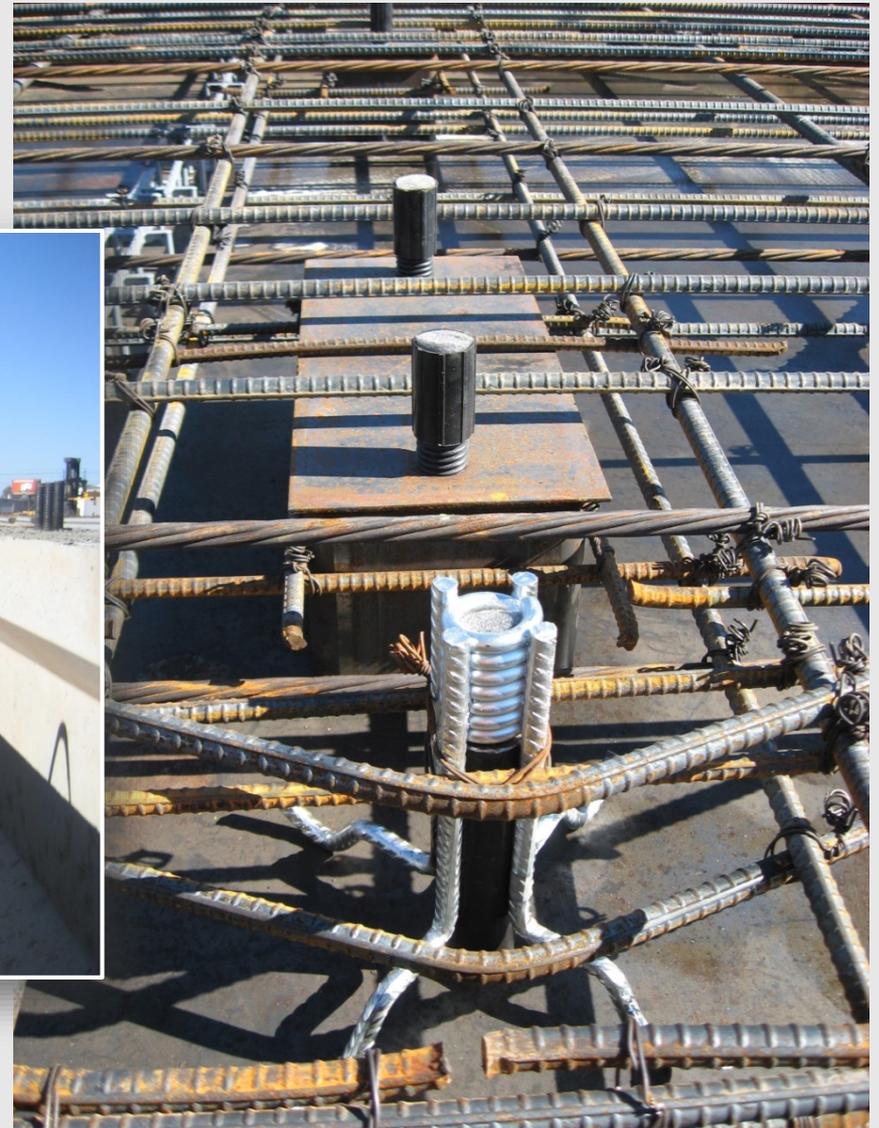
Full Depth Deck Panels



Full Depth Deck Panels: Long Line Casting at Prefabricator



Full Depth Deck Panels: Composite Connections



Full Depth Deck Panels: Panel Connections



Beam Systems

- **Bulb tee section unique to Texas: TxGirder**
- **Slab beams and box beams**
- **Spread slab beams and box beams**
- **Spliced concrete girders**

Decked Slab Beams



Decked Slab Beams



Spliced Precast Girders



Spliced Precast Girders



Spliced Precast Girders



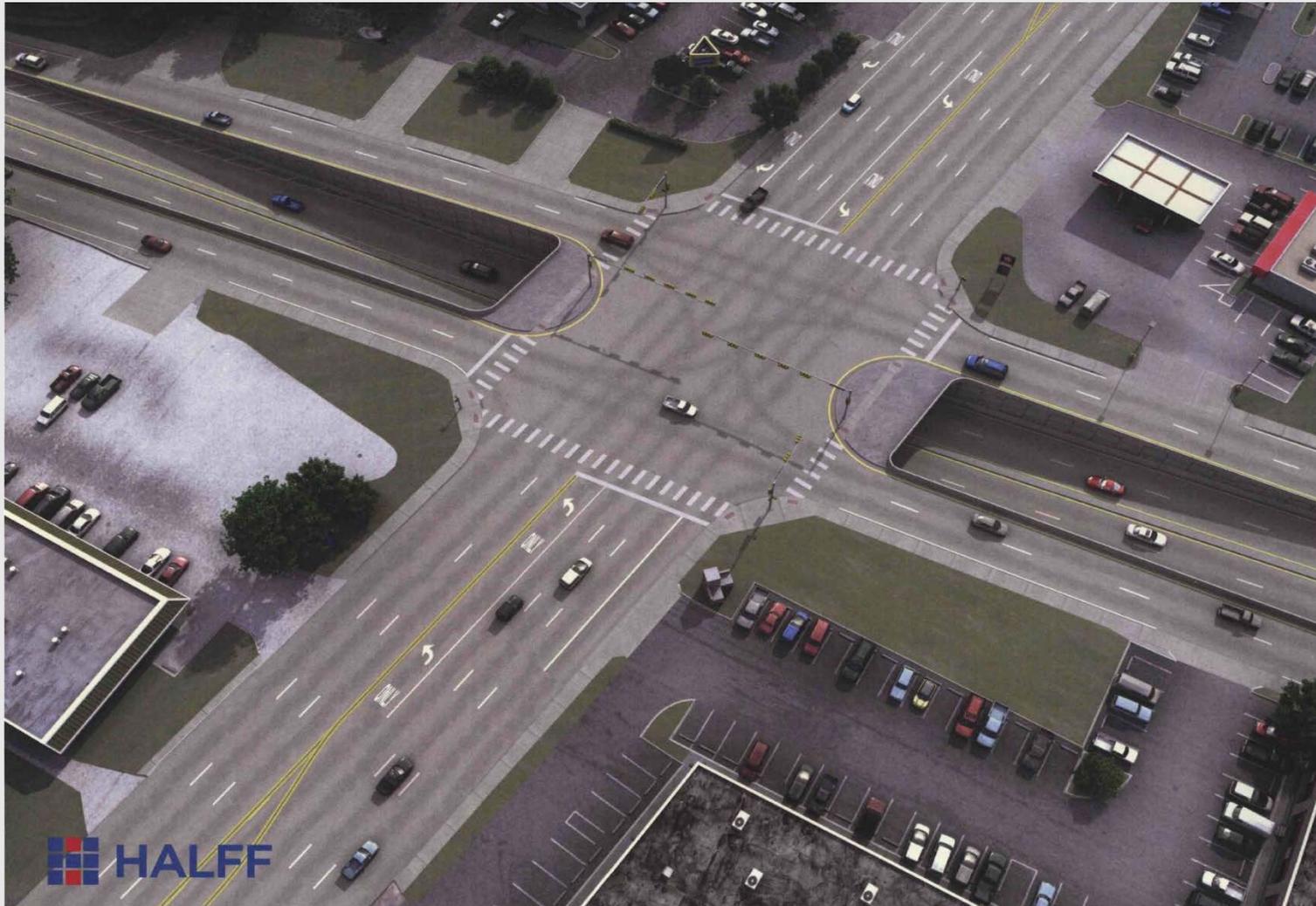
Spliced Precast Girders with Haunch



Slides/SPMT/Launching/Creative Phasing

- **Lateral slide**
 - One project: Loop 345 San Antonio
- **SPMT**
 - None yet
- **Launching**
 - Only as an erection technique for concrete girders
- **Creative phasing**
 - Houston tied arches
 - West 7th precast arches

LP 345 Lateral Bridge Slide



LP 345 Lateral Bridge Slide



Texas Sterling Construction

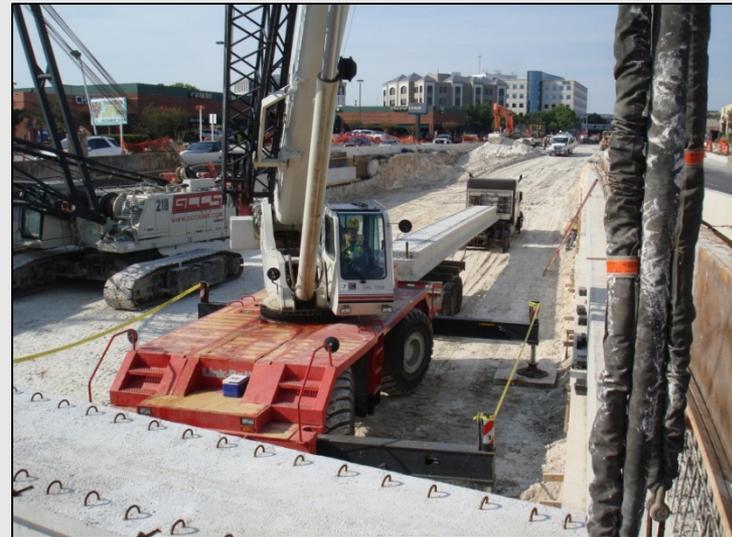
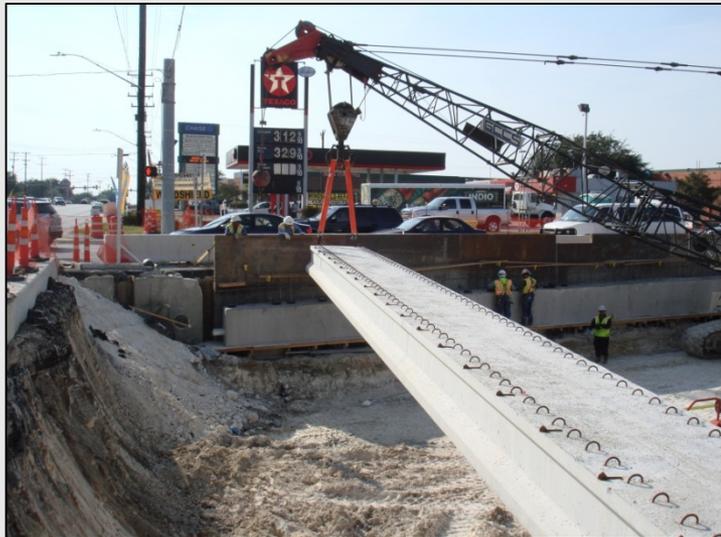
Texas Department of Transportation

H. Boyle Engineering, Inc.

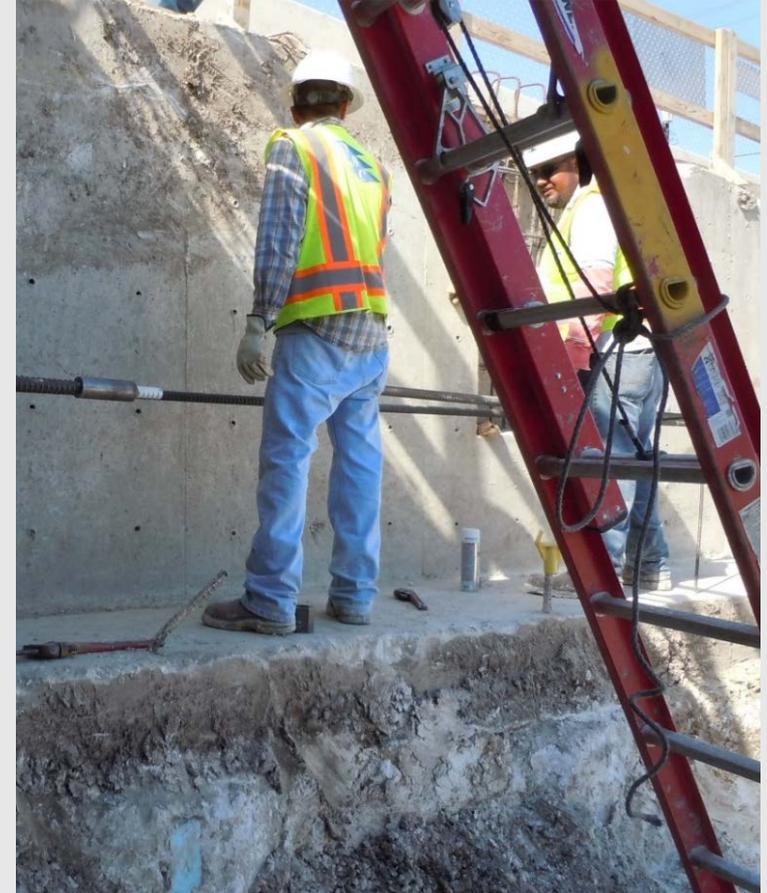
LP 345 Lateral Bridge Slide



LP 345 Lateral Bridge Slide



LP 345 Lateral Bridge Slide



Houston US 59 Tied Arches

- Existing structure used as erection platform



US 59 Tied Arches



US 59 Tied Arches



West 7th Street – Fort Worth



West 7th Street – Fort Worth

- Substructure and precast arches installed outside of existing bridge
- Floorbeams and deck installed after demolition of existing structure
- Allowed 4 months of total closure
- Finished 30 days early



West 7th Street: Precast Floorbeam Installation



Copyright 2015 • Texas Department of Transportation • All Rights Reserved

Entities or individuals that copy and present state agency information must identify the source of the content, including the date the content was copied. Entities or individuals that copy and present state agency information on their websites must accompany that information with a statement that neither the entity or individual nor the information, as it is presented on its website, is endorsed by the State of Texas or any state agency. To protect the intellectual property of state agencies, copied information must reflect the copyright, trademark, service mark, or other intellectual property rights of the state agency whose protected information is being used by the entity or individual. Entities or individuals may not copy, reproduce, distribute, publish, or transmit, in any way this content for commercial purposes. This presentation is distributed without profit and is being made available solely for educational purposes. The use of any copyrighted material included in this presentation is intended to be a “fair use” of such material as provided for in Title 17 U.S.C. Section 107 of the U.S. Copyright Law.



OUR GOALS

MAINTAIN A SAFE SYSTEM

ADDRESS CONGESTION

CONNECT TEXAS COMMUNITIES

BEST IN CLASS STATE AGENCY

Michael “Mike” D. Hyzak, P.E.

Bridge Design Group Leader

Bridge Design Section / Bridge Division

118 E. Riverside Drive
Austin, TX 78704-1202

512.416.2184 (o)

512.968.5413 (m)

512.416.2557 (fax)

Michael.Hyzak@txdot.gov

MAILING ADDRESS

125 E. 11th Street
Austin, TX 78701-2483